PerSysT Department
Annual Cropping Systems Research Unit

Centre de coopération internationale en recherche agronomique pour le développement

Use and environmental impact of cotton pesticides in French-speaking Africa

M. Vaissayre, Ouagadougou, September 15-18, 2008

Cotton Pests Problems

The cotton plant is a target for many pests, but insects are the main ones in Africa ...

Damage fluctuate according to place & climate, but losses can easily reach 80% of potential
according to Silvy (1995);

Fiber quality is affected either during boll set or after boll opening ...

Numerous insect species are present in Africa...

Mites

Insects

- Hemiptera,
  - jassids, aphids and whiteflies
  - mirids and true bugs
- Lepidoptera
  - leaf- eating caterpillars
  - bollworms

Helicoverpa, Diparopsis & Earias

Cryptophlebia & Pectinophora

Leading to important damage...

- Seedling damage reduces density (damping off);

- Sap uptake (by sucking pests) and reduction of the foliar area (by mirids and leaf eaters) disturb photosynthesis and nutrients allocation, affecting both plant growth and development;

- Shedding of squares and small bolls as well as boll rot resulting from fungi or insect injuries lead to direct yield reduction.

- Honeydew contaminating open bolls results in deterioration of fiber quality

Cotton pest management depends mainly on pesticides

Many pesticides can be used on cotton [Insecticides (65%), Herbicides (20%), Plant growth regulators, Defoliants and dessicants (14%), Fungicides (1%),]
But most of them are assocoiated with mechanized production systems (US, Uzbekistan, Australia)

→ Small farmers (in Africa as well as in India or China) are using quite exclusively insecticides

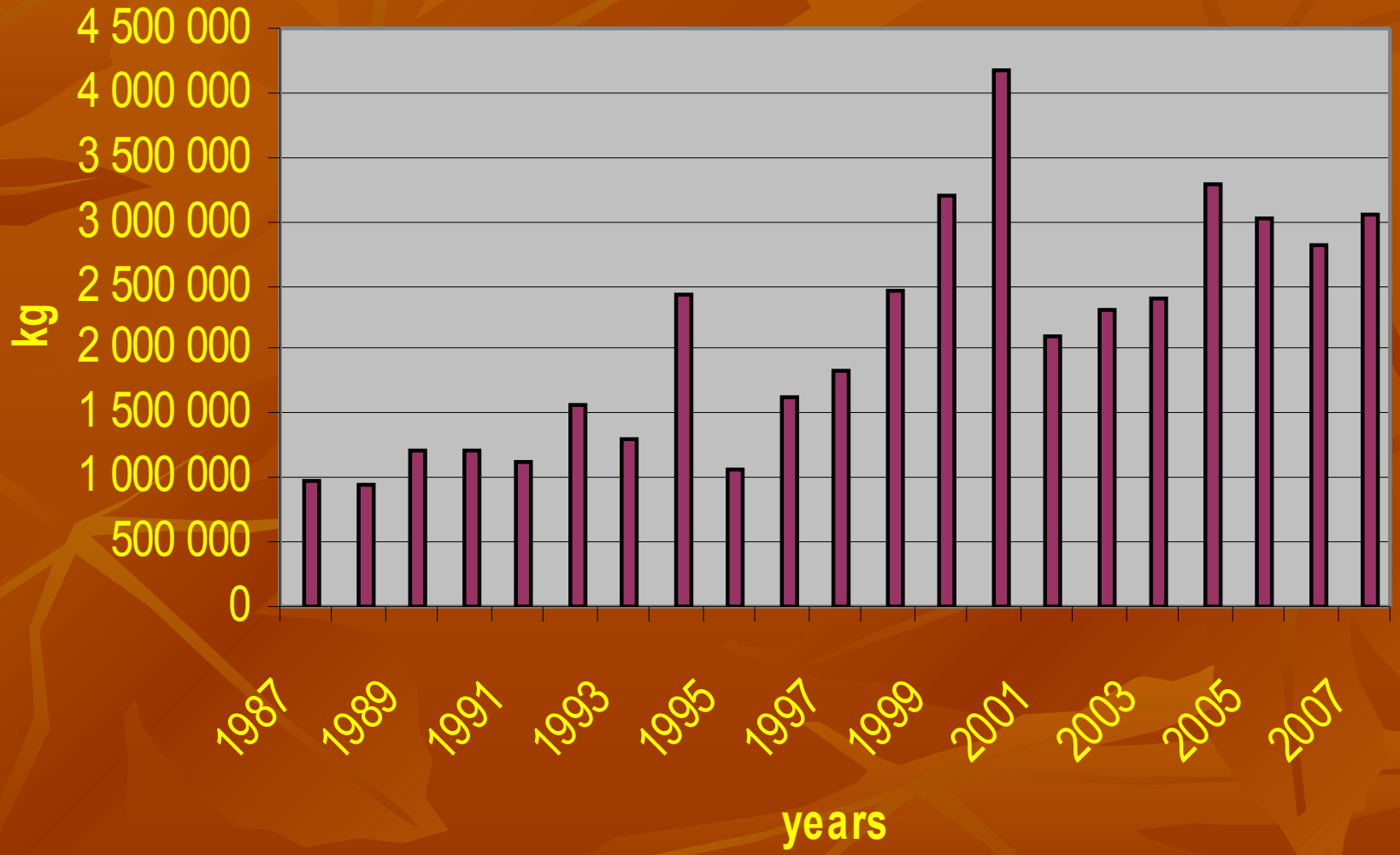
History of insecticide use...

In spite of varietal traits, used early for jassid resistance, and various intents to introduce biological control (NPV or egg parasites) pest management in African cotton relies quite exclusively on insecticides...

- first trials from 1950 onwards
- DDT and some of the "dirty dozen" first
- then OPs and until now pyrethroids

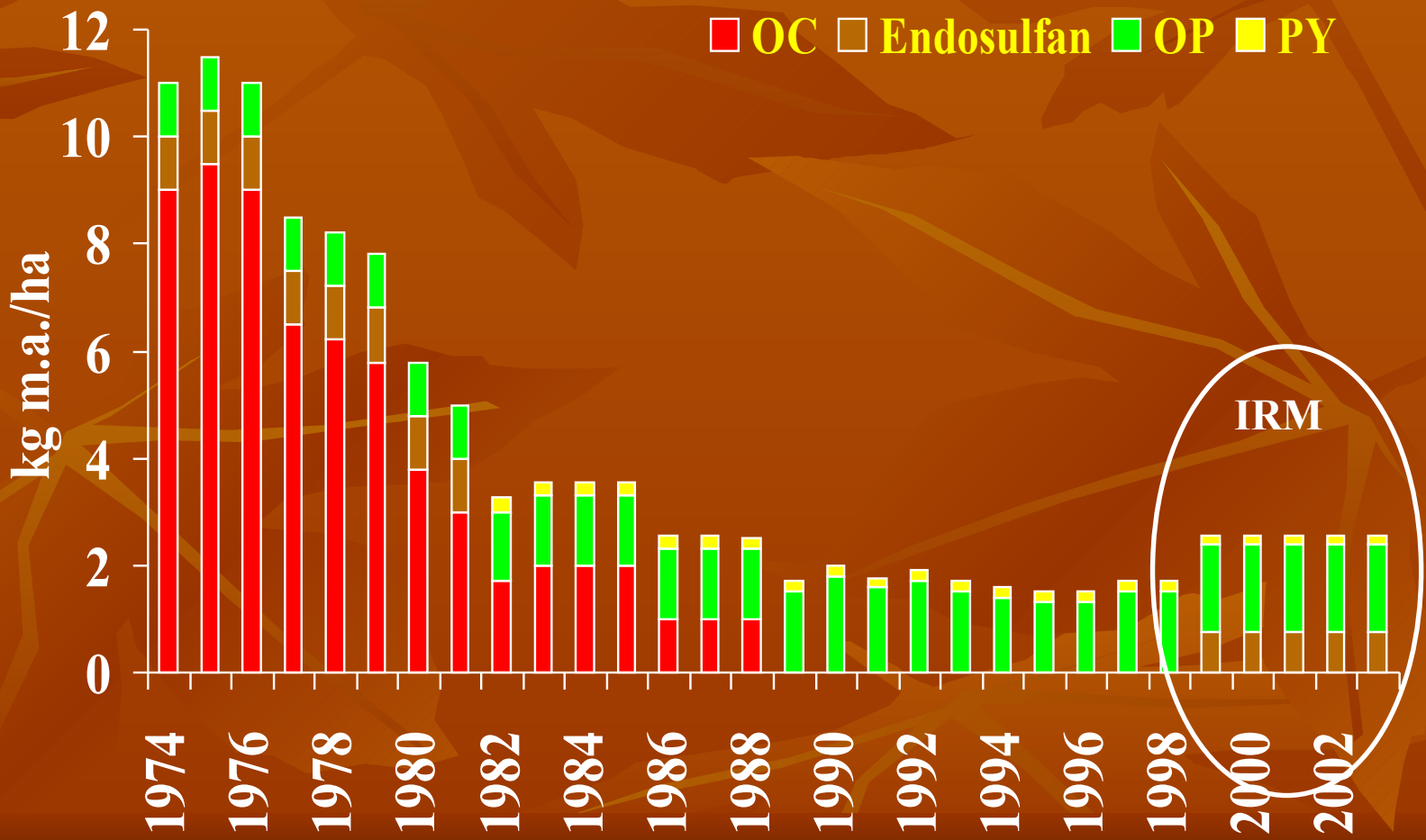
> With a uniform calendar based spraying program, leading to 4 to 7 sprays per season and moderate quantity used per ha.

Global insecticide use: 1987-2007

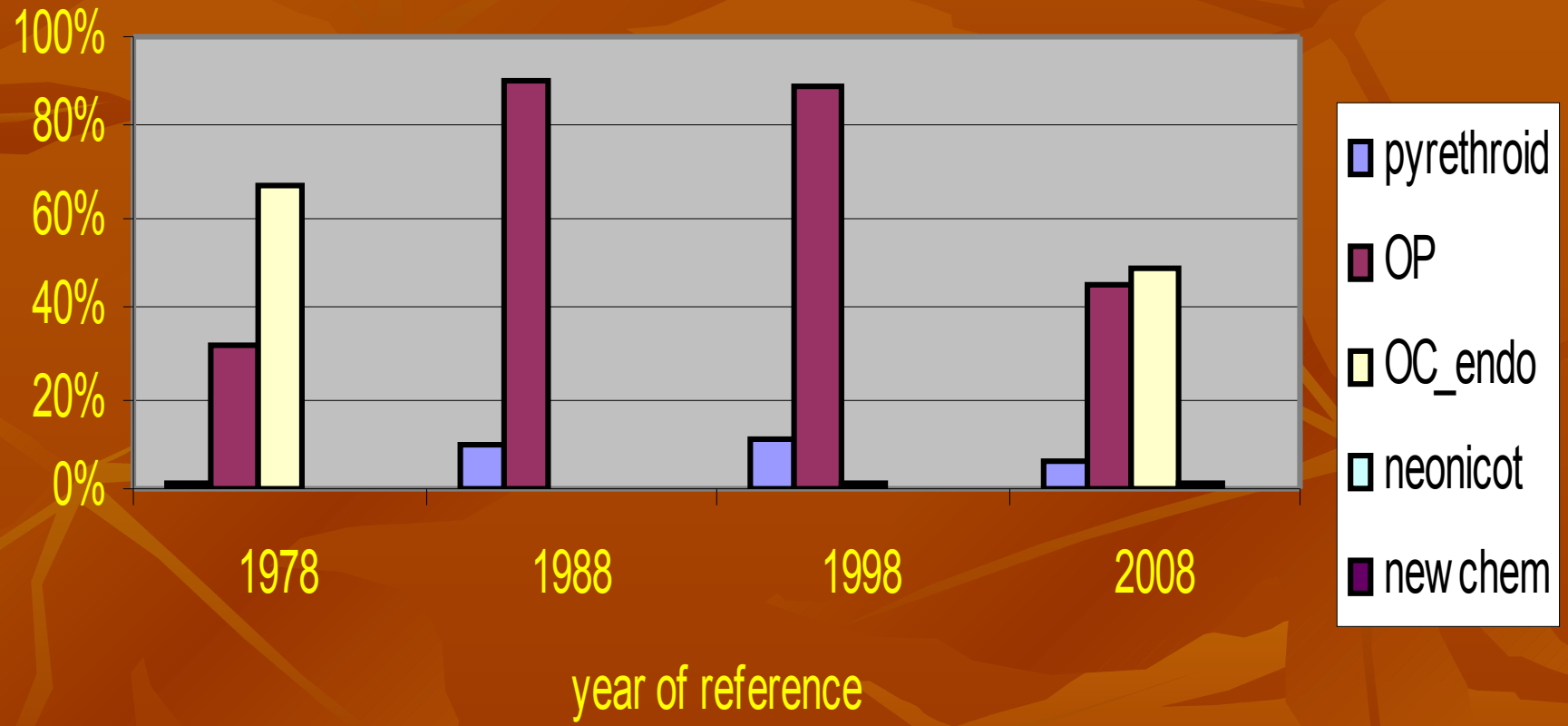


Insecticide use / ha.

Côte d'Ivoire; kg a.i./ha/year (from T. Martin)



trends in pesticide use 1978-2008
(percent a.i)



14 french-speaking countries (1988-2008 from Arysta LifeSci.)

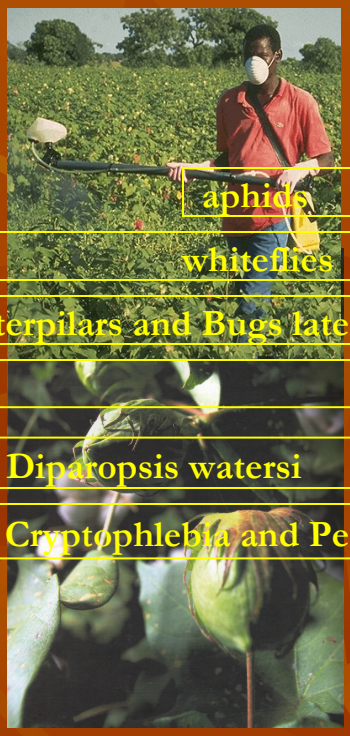
Current spraying programme

taking into account bollworm resistance to pyrethroids

Calendar-based spraying, fortnightly

1 or 2 with endosulfan

4 associating pyrethroid & organophosphate



sowing

flowering

fructification

First pick

jassids

aphids

aphids

whiteflies

Mirids, Leaf-eating caterpilars and Bugs later on

Helicoverpa armigera & Earias

Diparopsis watersi

Cryptophlebia and Pectinophora

No pyretroid

Mid August

Environmental impact : data

Year & EIQ	Cyper 27.3 % total	Profen 59.5	Dimet 74	Endos 42.1	EIQ Globally per ha
1987	110 t 8.21%	192 t 31.25%	208 t 42,1 %	0	**36 562** **37.1/ha**
1997	216 t 7.42%	380 t 28.46%	496 t 46.2 %	25 t 1.32%	**79 444** **35.3/ha**
2007	226 t 4.46%	1300 t 55.95%	0	1150 t 35.05%	**138 241** **86.2/ha**

Environmental impact: discussion

- Indicators (EIQ, EcoRR) are rather positive, comparing African cotton cropping systems with other countries (Europe) or production systems (fruits and vegetables)
- will be those Indicators better oriented, following endosulfan withdrawal ?
-A significant reduction of the Indicator's value can be obtained, as a result of pesticide reduction with decision support systems :
    - from LEC (« lutte étagée ciblée ») to TBI (Threshold-Based Intervention)

A questionable sustainability...

- ban of endosulfan in a context of drastic reduction of the flow of new chemistry

- a few new active ingredients available (at high price – opposite to reducing the cost of inputs)

… and some spreading issues, like insecticide resistance and the environmental impact of pesticides are threats to a sustainable pest management in Africa.

Problems associated with pesticide use

Insecticide resistance not only observed in the American bollworm, but also in aphids and probably whiteflies, and in spite of IRM, resistance is still present in West – and appeared some years ago in Central Africa.

Impact of insecticide use in agriculture is now acknowledged as affecting biodiversity (wildlife) and health, either directly of indirectly.

Problems associated with pesticide use by small farmers

- Lacking of information about health risks
- Poorly educated about safety procedures,
- underequipped by lack of money and means,

And not feeling themselves so concerned by environmental issues (contamination of soil and water)...

Africa towards IPM ?

- Some results about cultural practices could be transferred to farmers
-The query for insect-resistant cultivars is partly obtained with Bt cottons
-Insecticides will be still needed to enhance productivity (including Bt cotton) and results about threshold use are convincing,
-Reduced use of pesticides associated with Bt cotton will enhance natural control
- Sustainability is the key-factor to be considered (for new chemistry as well as for Bt toxins, …)

Conclusion

African farming systems are moderate users of pesticides, but:

- Farmers need to be trained about risks
- Insecticide use has to be as low as possible
  - threshold-based interventions have to be implemented all over the cotton producing area,
- Research is needed
  - to take into account environmental issues (contamination of soil and water)...
  - to improve the integration and evaluate the impacts of alternatives to pesticides

Thank you for your attention !